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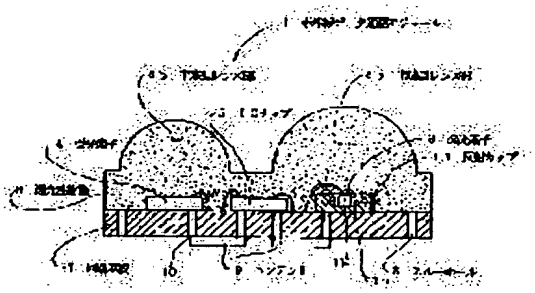
(54) INFRARED DATA COMMUNICATION MODULE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a very small and low-cost infrared data communication module which covers light-emitting elements mounted on a circuit board with reflective members, effectively condensing infrared beams from the elements into lenses so as to provide a low power consumption and high power for the element.
SOLUTION: This module has electronic components on a circuit board 7 mounted, including light-emitting elements 3, photodetectors 4 and an IC chip 5 and seals them with a translucent resin 6 so that the tops of the elements 3, 4 with semispherical lenses 6a, 6b are covered. The light-emitting elements 3 are fixed to the bottom face 11a of a reflective cup 11 having a slope 11b and bottom with a reflective film such as Ni plating on the slope 11b, to thereby reflect lateral infrared rays of LEDs upwards, thus realizing small-sized and low-power consumption high-speed long-distant communicating consumer appliances.



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CLAIMS

[Claim(s)]
[Claim 1] it be the infrared data communication module characterize by surround said light emitting device in the perimeter in the reflector of a reflective cup in the infrared data communication module which carry out a resin seal by translucency resin so that a flat surface mount electronic parts , such as a light emitting device , a photo detector , an IC chip , and a capacitor , in the circuit board side of an abbreviation rectangle configuration and cover the top face of said light emitting device and a photo detector in the semi-sphere mold lens section .
[Claim 2] The configuration of the reflector of said reflective cup is an infrared data communication module according to claim 1 characterized by being a reverse cone configuration.

[Claim 3] The configuration of the reflector of said reflective cup is an infrared data communication module according to claim 1 characterized by being a curve configuration.
[Claim 4] It is the infrared data communication module according to claim 2 or 3 characterized by for said reflective cup being a reflective cup of the owner bottom which fixed to said circuit board, and the light emitting device having fixed on the base of a reflective cup.
[Claim 5] It is the infrared data communication module according to claim 2 or 3 which said reflective cup is a reflective cup which has opening on the base which fixed to said circuit board, and is characterized by having located the light emitting device in base opening of a reflective cup, and having fixed soon to the circuit board.
[Claim 6] The infrared data communication module according to claim 4 or 5 characterized by forming a reflective thin film in the reflector of said reflective cup.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the infrared data communication module used for public welfare devices, such as a personal computer, a printer, PDA, facsimile, a pager, and a cellular phone.
[0002]
[Description of the Prior Art] In recent years, the miniaturization of an infrared data communication module is more strongly demanded by pocket devices, such as the notebook sized personal computer and PDA which carried the optical-communication function, and a cellular phone. The infrared data communication module which formed the transmitting section and a receive section into the 1 package is developed by the leadframe by the resin mold of direct die bond and lens one carry out wire bond and according to light cut EBOKISHI resin in the circuit section which consists of an IC in which the light emitting device which consists of LED, the photo detector which consists of a photodiode, amplifier, a drive circuit, etc. were included. About the structure of the conventional common infrared data communication module, drawing 5 - drawing 7 explain the outline. The front view in which drawing 5 shows the appearance of an infrared data communication module, the top view where drawing 6 saw through drawing 5 from the top face, and drawing 7 are the sectional views showing the internal configuration of drawing 5 .
[0003] drawing 5 - drawing 7 -- setting -- the infrared data communication module 1 -- the top-face side of a leadframe 2 -- a light emitting device 3, a photo detector 4, and the IC chip 5 -- die bond -- and wire bonding is carried out and it connects. While protecting said electronic parts, a resin seal is carried out so that the semi-sphere mold lens sections 6a and 6b with the function which irradiates and condenses infrared light for the top face of a light emitting device 3 and a photo detector 4 by translucency resin 6, such as epoxy system resin containing a visible-ray cut agent, may be formed. Since it mounts in the circuit pattern of mother boards which are not illustrated, such as a printed circuit board, terminal 2a of said leadframe 2 is sticking out outside from the body of the infrared data communication module 1.
[0004] As shown in drawing 6 and drawing 7 , inclined plane 2b of the reverse cone configuration fabricated by drawing etc. is formed in the location which mounts the light emitting device 3 of a leadframe 2, and the light emitting device 3 is mounted in the base surrounded by inclined plane 2b.
[0005] However, although it is effective in reflecting in a top face the infrared light which comes out of a light emitting device 3 in the infrared data communication module mentioned above since the light emitting device 3 is surrounded by inclined plane 2b of the leadframe 2 and really fabricated reverse cone configuration In order to arrange only in the top-face side of a leadframe 2 the light emitting device 3 which is the component part of the infrared data communication module 1, a photo detector 4, the IC chip 5, the capacitor that is not illustrated with the mounting structure which used the leadframe 2 The limitation was for a mounting tooth space to be effective against the area of a component part as it is, and make size small superficially. Moreover, since lead terminal 2a of a leadframe 2 was sticking out on the outside of

a body, the mounting tooth space between mother boards, such as a printed circuit board, became large, and there were various problems, such as barring high density assembly.
[0006] Then, electronic parts were mounted on the surface of the circuit board, and the micro infrared data communication module which made small the mounting tooth space to a mother board was developed. The sectional view of the infrared data communication module with which drawing 8 mounted electronic parts in the circuit board, and drawing 9 are the partial expanded sectional views showing the optical path of a light emitting device.
[0007] The outline is explained in drawing 8 . The flat surface which consists of a glass epoxy resin etc. is the circuit board which has the insulation of an abbreviation rectangle configuration, and the electric conduction pattern (not shown) formed in the top face and inferior surface of tongue connects 7 electrically through through hole electrode 8a of the through hole 8 formed in said circuit board 7. In addition, although the glass epoxy group plate was used for the circuit board 7, plastic film substrates, such as an alumina ceramic substrate, polyester, and polyimide, etc. may be used for it.
[0008] 3 is a light emitting device which consists of high-speed infrared rays LED, and 4 is a photo detector which consists of a photodiode. both mount in the top-face side of the circuit board 7, respectively -- having -- **** -- an electric conduction pattern -- die bond -- and wire bond is carried out and it connects. IC chip whose 5 has the circuit section in which high-speed amplifier, a drive circuit, etc. were included -- it is -- the electric conduction pattern by the side of the top face of the circuit board 7 -- die bond -- and wire bond is carried out. A capacitor 9 is soldered with solder 10 and connected to the inferior-surface-of-tongue side of said circuit board 7 through through hole electrode 8a of said through hole 8. When it does not mount capacitor 9 grade in the inferior-surface-of-tongue side of the circuit board 7, said through hole 8 is unnecessary.
[0009] 6 is translucency resin of the EBOKISHI system containing a light cut agent which carries out the resin seal of a light emitting device 3 and the photo detector 4 like the above-mentioned. Both components are protected at the same time it forms the semi-sphere mold lens sections 6a and 6b in the top face of a light emitting device 3 and a photo detector 4 and gives the exposure of infrared light, and the function of condensing with translucency resin 6. Even if it closes the capacitor 9 mounted in the inferior surface of tongue of the circuit board 7 by closure resin
[0010] In drawing 9 , although many of infrared light from the light emitting device 3 by which wire-bonding mounting was carried out on the circuit board 7 is condensed like the infrared light A condensed up by semi-sphere mold lens section 6a formed in the top face, like the infrared light B which comes out to a longitudinal direction, it will not be condensed by the lens but a remarkable infrared light will leak to a longitudinal direction.
[0011]
[Problem(s) to be Solved by the Invention] However, there are the following troubles in the infrared data communication module mentioned above. That is, as an infrared data communication module, IrDA has two types and IrDA1.0 specification (Tsuyoshi Nakade) and 1.1 specification (high power) are in the one type. When the high power of LED by 1.1 specification was required, in order to realize a high increase in power by condensing only in the semi-sphere mold lens section since a part of infrared light from a light emitting device comes out to a longitudinal direction as described above, it could not but depend on LED or the diameter of a lens had to be made fairly large. When the current passed to LED was raised greatly, while this caused degradation of the output of LED, it became fatal problems, such as becoming the hindrance of low-power-izing of a set.
[0012] This invention is made in view of the above-mentioned conventional technical problem, and the purpose offers the micro and cheap infrared data communication module which can measure low-power-izing and the high increase in power of a light emitting device by surrounding the perimeter of the light emitting device carried in the circuit board side by the reflective member, and making a lens condense the infrared light from a light emitting device effectively.
[0013]
[Means for Solving the Problem] in order it attain the above-mentioned purpose , characterize

by surround said light emitting device in the perimeter in the reflector of a reflective cup in the infrared data communication module which carry out a resin seal by translucency resin so that a flat surface mount electronic parts , such as a light emitting device , a photo detector , an IC chip , and a capacitor , in the substrate side of an abbreviation rectangle configuration and the infrared data communication module in this invention cover the top face of said light emitting device and a photo detector in the semi-sphere lens section .

[0014] Moreover, the configuration of the reflector of said reflective cup is characterized by being a reverse cone configuration.

[0015] Moreover, the configuration of the reflector of said reflective cup is characterized by being a curve configuration.

[0016] Moreover, said reflective cup is a reflective cup of the owner bottom which fixed to the circuit board, and it is characterized by the light emitting device having fixed on the base of a reflective cup.

[0017] Moreover, said reflective cup is a reflective cup which has opening on the base which fixed to the circuit board, and it is characterized by having located the light emitting device in base opening of a reflective cup, and having fixed soon to the circuit board.

[0018] Moreover, it is characterized by forming a reflective thin film in the reflector of said reflective cup.

[0019]

[Embodiment of the Invention] Hereafter, based on a drawing, the infrared data communication module in this invention is explained. The partial expanded sectional view in which drawing 1 shows the sectional view of an infrared data communication module, and drawing 2 shows the optical path of the light emitting device of drawing 1 with respect to the infrared data communication module drawing 1 R> 1, drawing 2 , and whose drawing 3 are the gestalten of operation of the 1st of this invention, and drawing 3 are the sectional views of a reflective cup. In drawing, the same sign shows the same member as the conventional technique.

[0020] in drawing 1 - drawing 3 , since it be the same as that of the above-mentioned conventional technique to constitute the infrared data communication module 1 which carry out a resin seal from translucency resin 6 so that a flat surface may mount the electronic parts of a light emitting device 3, a photo detector 4, the IC chip 5, and capacitor 9 grade in the 7th page of the circuit board of an abbreviation rectangle configuration and may cover the top face of said light emitting device 3 and a photo detector 4 in the semi-sphere lens sections 6a and 6b, explanation be omit.

[0021] As shown in drawing, said light emitting device 3 has fixed to base 11a of the reflective cup 11 mentioned later which has the reflector which inclined the perimeter in the reverse cone configuration.

[0022] Said reflective cup 11 has inclined plane 11b of the reverse cone configuration of an owner bottom for a conductive member, for example, SuS material, and phosphor bronze material by press working of sheet metal etc., and the tilt angle of this inclined plane 11b and its alpha= 30-45 degrees are the optimal. By the means for detachable of electroconductive glue etc., said reflective cup 11 has fixed to the electric conduction pattern of said circuit board 7.

[0023] In order to raise the reflective effectiveness of the infrared light from a light emitting device 3 (high-speed infrared rays LED), nickel deposit is formed in base 11a of said reflective cup 11, and inclined plane 11b by silver reflective thin film 11c, for example, electrolysis nickel plating.

[0024] As shown in drawing 2 , as for all infrared light, it is possible to make it condense efficiently by semi-sphere mold lens section 6a formed up without futility like the infrared light A which the infrared light B out of which the infrared light from a light emitting device 3 (high-speed infrared rays LED) comes to a longitudinal direction conventionally is reflected by reflective thin film 11c formed in inclined plane 11b of the reflective cup 11, and is condensed up. In addition, it may describe above, the quality of the material of the reflective cup 11 may not be restricted to a conductive member, and, in the case of a non-conductive member, you may flow with the electric conduction pattern of the circuit board 7 through a through hole etc.

[0025] Drawing 4 is the sectional view of a reflective cup with respect to the infrared data

communication module which is the gestalt of operation of the 2nd of this invention.
[0026] In drawing 4 , like the reflective cup 11 from which it has opening 12a on a base resin fabrication etc., and said reflective cup 12 mentioned above the non-conductive member, for example, a plastic member, the reflective cup 12 has inclined plane 12b of a reverse cone configuration, and the tilt angle of this inclined plane 12b and its alpha=30-45 degrees are the optimal. The light emitting device 3 was located in opening 12a of the base of the reflective cup 12, and has fixed the light emitting device 3 soon to the electric conduction pattern on the circuit board 7. By the means for detachable of adhesives etc., said reflective cup 12 has fixed on the circuit board 7 so that said light emitting device 3 may be surrounded. Silver reflective thin film 12c is formed in inclined plane 12b of said reflective cup 12 by non-electrolyzed nickel plating etc. like ****. It cannot be overemphasized that said reflective cup 12 is not what is restricted to a non-conductive member.
[0027] Also in the reflective cup 12 shown in drawing 4 , all the infrared light from a light emitting device 3 (high-speed infrared rays LED) can be efficiently condensed by semi-sphere mold lens section 6a formed up without futility.
[0028] Drawing 5 is the sectional view of a reflective cup with respect to the infrared data communication module which is the gestalt of operation of the 3rd of this invention.
[0029] In drawing 5 , as mentioned above, the reflective cup 13 has curve side 13b of the curve configuration of an owner bottom for a conductive member, for example, SuS material, and phosphor bronze material by press working of sheet metal etc., and the include angle of the normal of curve side 13b and base 13a to make and its beta= 30-45 degrees are the optimal. By the means for detachable of electroconductive glue etc., said reflective cup 13 has fixed to the electric conduction pattern of said circuit board 7.
[0030] Silver reflective thin film 13c is formed in base 13a of said reflective cup 13, and curve side 13b by electrolysis nickel plating etc. like ****.
[0031] Drawing 6 is the sectional view of a reflective cup with respect to the infrared data communication module which is the gestalt of operation of the 4th of this invention. In drawing 6 , as mentioned above, it has opening 14a on a base by resin fabrication etc. for a non-conductive member, for example, a plastic member, a reflector is formed in curve side 14b, and the include angle of the normal of curve side 14b and the base of the reflective cup 14 to make and beta= 30-45 degrees are the optimal like ****. Silver reflective thin film 14c is formed in curve side 14b by non-electrolyzed nickel plating etc. like ****.
[0032]
[Effect of the Invention] According to this invention, as explained above, a light emitting device and a photo detector are mounted in the top-face side of the circuit board at least, and a resin seal is carried out by translucency resin so that the top face of said light emitting device and a photo detector may be covered in the semi-sphere mold lens section. As for said light emitting device, by surrounding the perimeter in the reflector of a reflective cup, all the infrared light from a light emitting device can be condensed efficiently, and can raise the intensity of radiation on an optical axis by the semi-sphere mold lens section formed up without futility.
[0033] Moreover, all the infrared light from a light emitting device can make it condense efficiently by making the reflector of a reflective cup into a reverse cone configuration by the semi-sphere mold lens section formed up without futility.
[0034] Moreover, all the infrared light from a light emitting device can make it condense efficiently by making the reflector of a reflective cup into a curve configuration by the semi-sphere mold lens section formed up without futility.
[0035] Moreover, a reflective cup is a reflective cup of the owner bottom which fixed to the circuit board, and all the infrared light from a light emitting device can make a light emitting device condense efficiently by fixing on the base of a reflective cup by the semi-sphere mold lens section formed up without futility.
[0036] Moreover, a reflective cup is a reflective cup which has opening on a base, a light emitting device can be located in opening of the base of a reflective cup, and all the infrared light from a light emitting device can make it condense efficiently by fixing soon to a substrate by the semi-sphere mold lens section formed up without futility.

[0037] Moreover, the reflective effectiveness of the infrared light from a light emitting device can be made to raise by forming a silver reflective thin film in the base and reflector of said reflective cup.
[0038] As mentioned above, the infrared data communication module by which the high increase in power of LED was measured with the low power can be offered, and it is small, and it is a low power and implementation of the public welfare device of a high speed and a long-distance communication link is possible.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view of the infrared data communication module concerning the gestalt of operation of the 1st of this invention.
[Drawing 2] It is the partial expanded sectional view showing the optical path of the light emitting device of drawing 1 .
[Drawing 3] It is the sectional view of the reflective cup of drawing 1 .
[Drawing 4] It is the sectional view of the reflective cup concerning the gestalt of operation of the 2nd of this invention.
[Drawing 5] It is the sectional view of the reflective cup concerning the gestalt of operation of the 3rd of this invention.
[Drawing 6] It is the sectional view of the reflective cup concerning the gestalt of operation of the 4th of this invention.
[Drawing 7] It is the appearance front view of the conventional infrared data communication module.
[Drawing 8] It is the top view seen through from the top face of drawing 5 .
[Drawing 9] It is the sectional view of drawing 6 .
[Drawing 10] It is the sectional view of other conventional infrared data communication modules.
[Drawing 11] It is the partial expanded sectional view showing the optical path of the light emitting device of drawing 8 .
[Description of Notations]
1 Infrared Data Communication Module
3 Light Emitting Device
4 Photo Detector
5 IC Chip
6 Translucency Resin
6a, 6b Semi-sphere mold lens section
7 Circuit Board
11, 12, 13, 14 Reflective cup
11a, 13a Base
11b, 12b Inclined plane
13b, 14b Curve side
11c, 12c, 13c, 14c Reflective thin film
12a, 14a Opening
A Infrared light condensed up
B Infrared light which comes out to a longitudinal direction
alpha Tilt angle
beta Include angle of the normal of a curve side, and a base to make

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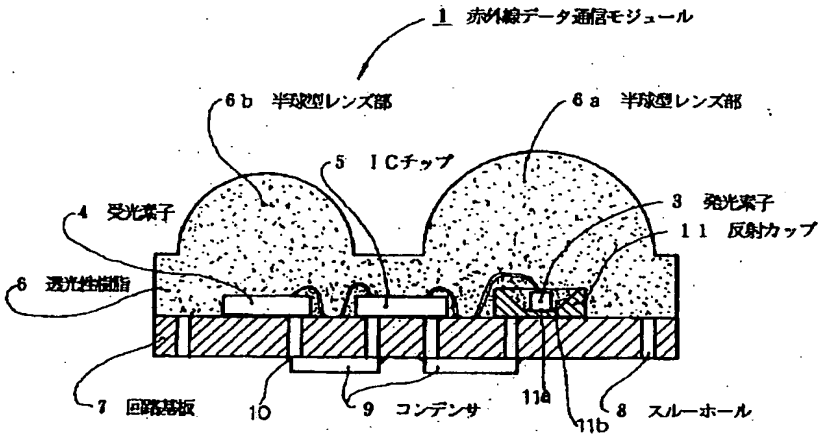
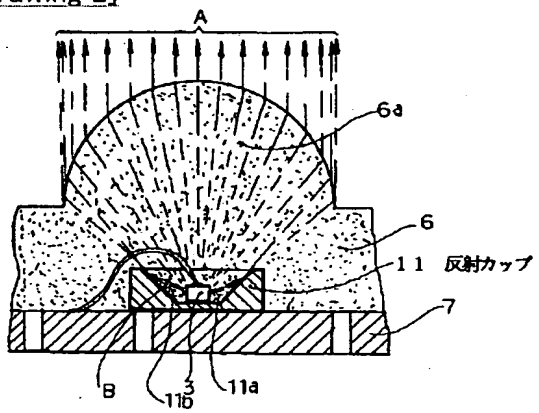
DRAWINGS

[Drawing 1]



[Drawing 2]



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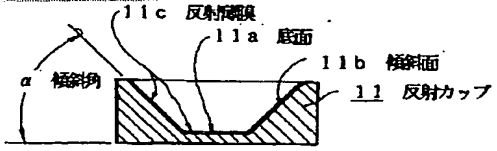

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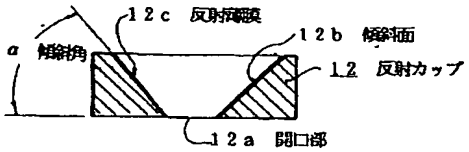

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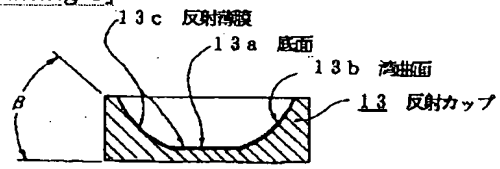

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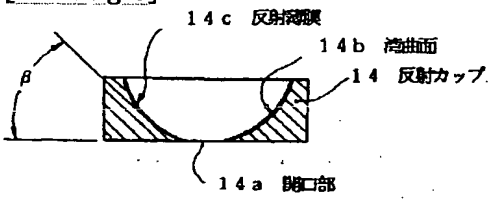
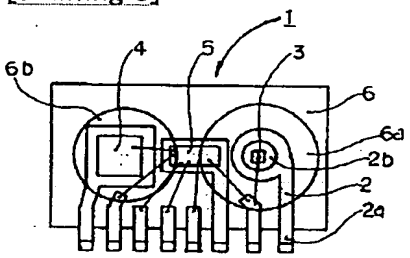


[Drawing 8]



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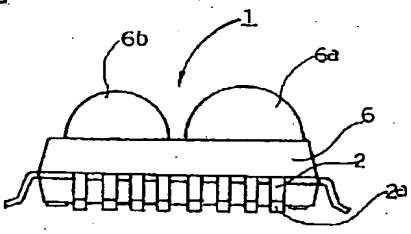

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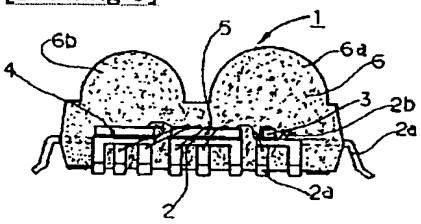

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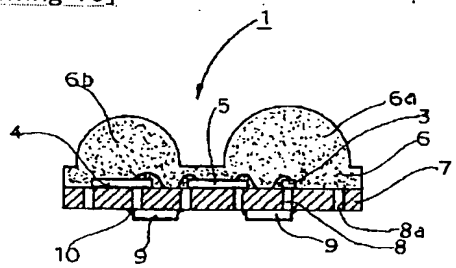

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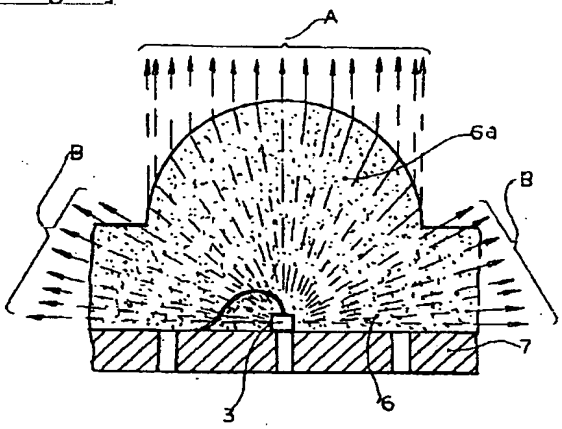

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